(i) Printed Pages: 2

(ii) Questions : 9

Roll No. .....

Sub. Code : 3725

Exam. Code : 0475

M.Sc. Physics 4th Semester

(2054)

PARTICLE PHYSICS—II

Paper : PHY–8045

Time Allowed : Three Hours] [Maximum Marks : 80

Note :—Attempt **FIVE** questions in all, selecting **ONE** question each from Units I–IV and the compulsory question from Unit V.

## UNIT—I

1. (a) What are fundamental and conjugate transformations ? Explain with example. How do they transform ?

   (b) What are irreducible representations ? Construct the irreducible representations for mesons in SU(6). 10,6

2. (a) What is orthogonal group ? Show that generators of infinitesimal rotation are Hermitian.

   (b) Write a note on $\omega - \varphi$ mixing. 8,8

## UNIT—II

3. (a) Calculate the masses of $\Omega$, $\Xi$ and $\Sigma$ particles using spin-spin interaction in colour quark model of hadrons.

   (b) Why the hadrons are colourless ? 12,4

4. (a) Discuss deep inelastic scattering and quark parton model.

(b) Write a note on electromagnetic form factors of nucleons. 10,6

## UNIT—III

5. (a) Discuss the introduction and construction of Yang-Mills theory in SU(2).

(b) Write a note on QCD. 10,6

6. (a) Explain the essential features of GIM model.

(b) Why vector and axial vector coupling is different for nuclear beta decay ? Explain. 12,4

## UNIT—IV

7. (a) Write a note on Higgs Boson properties and its discovery.

(b) Explain the unification of electromagnetic and weak interactions. 8,8

8. (a) Explain the phenomenon of spontaneous symmetry breaking.

(b) What is the particle content in standard model ? 12,4

## UNIT—V

9. (a) What is J/psi meson ?

(b) Explain the terms Quark confinement, Asymptotic Freedom and Renormalization.

(c) Estimate the range of weak interactions.

(d) What are grand unified theories ?

(e) What are neutrinos ? Write spin, charge and helicity of neutrino.

(f) What is permutation symmetry ? 3,3,3,3,2,2